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EFFECT OF FOLIAR SPRAY OF MULTI MICRONUTRIENT GRADE IV AND DIFFERENT FRUIT COVERING BAGS ONYIELD AND DIFFERENT QUALITY OF POMEGRANATE CV. BHAGWA

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ABSTRACT

The objective was this perusal to determine the foliar application of multi micronutrient grade IV and different fruit covering bags on the yield and different quality of pomegranate cv. Bhagwa. Treatment comprised of three levels of micronutrient grade IV (M) viz., Micronutrient grade IV @ 0.5% (M_1), Micronutrient grade IV @ 1% (M_2), Micronutrient grade IV @ 1.5% (M_3) and five levels of different fruit covering bags (B) viz., Control (B_1), News paper bag (B_2), Brown paper bag (B_3), White paper bag (B_4) and Non wooven bag (B_5). Among the different concentrations of multi micronutrient grade IV and different fruit covering bags, micronutrient grage IV @ 1% (M_2) and brown paper bag (B_3) were significantly influenced on production and quality of the fruits.

KEYWORDS: Pomegranate, Foliar spray, Multi micronutrient grade IV & Covering bags

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Original Article

INTRODUCTION

Pomegranate (*Punicagranatum* L.) cv. Bhagwa is related to the Lythraceae family and is indigenous from Iran to Northern India. It has 18 chromosomes, one genus and two species, the other one little known *P. protopunica* Balf. It is the main fruit of arid and semi-arid areas of the world and it is one of the ancient, known eatable fruit that is able to grow in various agro-climatic situations and status from the tropical up to sub-tropical region. Under a temperate environment, it behaves as a deciduous plant, while in tropical and subtropical conditions, it behaves like an evergreen or partial deciduous plant. It desires a lengthy, warm and waterless season so as to bring abouta greater yield of high quality fruits. The utilization of this fruit is extremely inserted in khuman background with respect in plenty oldest cultures about it is utilization in foods and medicines (Holland *et al*., 2007). Pomegranate are desirable and choicest table fruits. Juices are considered for their medicinal attributes mostly for leprosy patients. Due to the content of anti-oxidants, its juice is utilized as a chilling component cooler of liquids and several medicines for dyspepsia. The fruit peel, rind and its seed are utilized for astringent in the occasion of diarrhoea and dysentery. Some kind of wine made from the juice of this fruit can compare to wine from grapes. Sweet kinds of these fruits are brilliant for softly laxative, but little sweet kinds of fruits are well for inflammation of heartache and stomachache. The seeds are considered to be gastric and the pulps are cardiac and stomachic (Anon., 1998).

Bagging is an important physical protection method for pomegranate. The major issues during the fruit

development stage is fruit sucking moth and anar caterpillar. Fruits are protected through fruit covering and through different covering materials. Pomegranate fruits are sensitive to sunlight, sun burning, internal breakdown and fruit cracking are some of the main physiological disorders that negatively affect the production and quality of fruits. When the ripen fruits crack, they will be attacked by some fungus and bacteria, after that it losses the marketable cost and mostly not good for human being utilization. Bagging significantly helps in controlling the fruit flies infestation which is usually found at the immature stage of the fruit. This benefits food growth, reduces viral diseases and reduces pesticides usage on fruits. Bagging also helps to protect fruits against squirrels. Covering fruit in the time of growth will reduce the opportunity of physical destruction, enhance color at harvest time and achieved high yield and quality fruits. It increases the peel colour, lightness, redness, fruit length, fruit diameter and grain weight percentage. The biggest role of fruit covering is to successfully keep fruit from physical factors like cracking, bird damaging and discoloration.

Micronutrients play a major role in the production and quality of the fruit, whereas deficiency causes in decreasing of fruit production. Foliar application of different micronutrients especially copper, boron, zinc, iron and manganese enhances the qualities and quantities of fruit production. Spraying of micronutrients should be applied after full blooming. Zn is the main element for the development and activation of chlorophyll, in the function of various enzymes, growth hormones and auxin. B is a component of the cell membrane and it is an essential element for cell partition. It acts as a manager of calcium/potassium ratio in plants, helps in nitrogen intake and movement of sugar in plants with enhancement in fruit size and yield. Iron increases the chlorophyll amount of the yield, considering the color of the leaves. Fe is an important element for metabolic processes like DNA composition, in photosynthesis and respiration of plants. Cu is one of the micronutrients, which plants needed in small quantities. In plants, Cuinduces many enzymes, which is presented in lignin composition and it is an essential element in various enzymatic activity. Manganese is required for chlorophyll composition to make aspiration, photosynthesis, and nitrate assimilation for the function of different enzymes. There is a considerable variation in yield from area to area. However, on average, it can yield 10-12 t/ha. Pomegranate yield is higher in response to foliar spray of copper, boron, zinc, iron and molybdenum. Application of the right amount of micronutrients is very important in any crop. Balanced nutrition is very important for the highest production and quality of fruit. We must be careful about the recommended concentration of micronutrients because a high amount will be toxic for the plant.

MATERIALS AND METHODS

The research experiment was accomplished at Lal Baug, which is a famous Fruit Research Station of Horticulture Department in Junagadh Agricultural University in 2020. The investigation was conducted on five years old pomegranate plants of cv. Bhagwa with fifteen treatments and three replications in Factorial Randomized Block Design. The total number of plants were forty five and the spacing was 3m × 4m. The experimental plants were subjected to the treatments as: M_1 : Micronutrient grade IV @ 0.5%, M_2 : Micronutrient grade IV @ 1%, M_3 : Micronutrient grade IV @ 1.5% and Control (B_1), News paper bag (B_2), brown paper bag (B_3), white paper bag (B_4) and Non-woven bag (B_5). The first spray of micronutrient grade IV was applied at the time of flowering and the second is done three weeks after the first flowering and fruits were covered after full fruit set. Observation on fruiting parameter and number of flowers, fruit yielding parameters, physical parameters, chemical parameters, quality parameters and disease-pest incidence were recorded during the experiment. Statistical analysis was done by the procedure of analysis of variance (ANOVA) for Factorial Randomized Block Design (FRBD) by Panse and Sukhatme (1985).

RESULTS AND DISCUSSIONS

The obtained result showed that maximum fruit set (49.78 %), number of fruits/tree (50.70), fruit yield (4.86 kg/tree), fruit weight (180.78 g), fruit volume (168.60 ml), fruit length (74.36 mm), total sugar (12.82 %), ascorbic acid (17.23 mg/100 g) peel colour (7.11 score), aril colour (7.01 score) and shelf life (26.20 DAH) were recorded with treatment M_2. Whereas, maximum fruit breadth (66.56 mm) was recorded with treatment M_1. Minimum acidity (0.34 %), fruit cracking (2.40 %) and fruit borer (7.46 %) were also recorded in treatment M_2. The micronutrient grade IV increased the concentration of Fe and Zn which induces photosynthetic activity and produce more biomass as well as Zn aid to boost synthesis of auxin in plant and several other micronutrients activate the enzymes which help in protein and carbohydrate metabolism which resulted in increase the different flowers per tree (Ryugo, 1988). Micronutrient also contains boron which might have been increased the fruit set percentage, fruit set percentage will increase due to reduction of fruit drop (Alloway, 2008). Micronutrients boost fruit yield and it is because of the foliar application of micronutrients that play an important function in various physiological processes as well as enzymatic activity. In the case of fruit yielding, plants sprayed with foliar application of zinc, boron and iron showed a higher number of flowers/trees (Preethi*et al*., 2017. It is a clear fact that zinc has a certain duty in the decomposition of abstruse polysaccharide to simple sugar, composition of metabolite and swift displacement of photosynthetic product and mineral from other parts of the plant to improving fruit leading to enhance fruit heaviness and fruit bulk (Rawat*et al*., 2010). The enhanced fruit heaviness and fruit bulkis because of enhanced rate of cell partition and cell elongation prominent to many aggregation of metabolism in the fruit (Babu and Singh, 2001). Furthermore, stimulation of plant metabolism by micronutrients increase fruit breadth and fruit length. The high fruit breadth will be associated with the stimulative effects of plant metabolites (Das *et al*., 2000). Zinc helps in regulating the cell membrane penetrability,that's way permitting many movement of water in fruits that attributes to the higher fruit weight and length (Wali*et al*., 2005). Another possibility for higher TSS might be the increased total sugar content in fruit pulp. Maximum ascorbic acid and lowest acidity might be due to B comforted sugar transportation by B sugar complex and it also enhances the decomposition of saccharide to simple sugars (Shanmugavelne*et al*., 1973). Fe plays a major role in photosynthesis performance that causes greater photosynthetic rate. The major products of photosynthetic process are sugars, so increase in photosynthetic process considers to enhance the sugar compound and causes many soluble solids in juice of pomegranate fruits. The diminution in acidity is because of collection of total sugars (Sohrab*et al*., 2013).Spray of Zn as a form of sulfate declined cracking (%), alongside with development of fruit production (Singh *et al*., 2017) because of its effect on water consumption and transportation along side with affecting activity of enzymeinclude in protein, carbohydrate, and nucleic acid metabolism which is presented by Sadeghzadeh (2013). However, many workers offered that spray of Zn sulfate and paclobatrazol were beneficial for decreasing the percentageof cracking (Prasad *et al*., 2003 and El- Khawga, 2007). The similar result was defined by Bhoyar and Ramdevputra in guava; Babu and Singh (2001) in litchi; Hasani*et al*., (2012), Mishra and Polara (2020) and Dhurve*et al*., (2018) in pomegranate; Ding and Syakirah (2010)and Rajput (1976) in mango.

The alteration by several fruit covering bags were observed non-significant on fruit set, number of fruits/tree, fruit breadth, acidity and ascorbic acid but fruit production, fruit volume, fruit weight, fruit length, total sugar, peel colour, aril colour, shelf life, fruit cracking and fruit borer were significantly influenced by covering bags. Maximum fruit yield (4.64 kg/tree), fruit weight (191.87 g), fruit volume (168.65 ml), fruit length (74.27 mm), total sugar (12.57 %), peel colour (7.06 score), aril colour (7.23 score) and shelf life (27.22 DAH) were noted in B_3. Whereas, minimum fruit cracking (1.00 %) and fruit borer (2.65 %) were also obtained in B_3. As we know that brown paper bag was strong against sun, birds and

environmental damaging factors, compared to other covering bags, so it gives good result in several parameters. The result of brown paper might be due to its effect of brown colour for maintaining the inner temperature as well as it might be acted as a repellent for the birds, insects, etc. Brown paper bag lower the attacking of fruit fly and sunburn (Sarker*et al*., 2009), it improves fruit colour (Ding and Syakirah, 2010). About brown paper bags, there is nothing special inherent, but only things that is porous and that porous permit air to go inside and outside of the bags. The outcome was also founded by Fenga*et al*., (2014) in apple, in pomegranate, Gawad-Nehad*et al*., (2017) in mango. Increase rate of total sugar because of the decomposition of polysaccharides to water soluble sugars such as glucose, fructose and sucrose. This increase in total sugars of bagged fruits could be attributed to enhance carbohydrate metabolism. The pre-harvest fruit bagging creates a micro climate in which temperature increases and it ensure good fruit quality which helps in improving the total sugars. The enhanced in level of total sugars inside the bagged fruits may be due to enzymatic activity like sucrose synthetase and sucrose phosphate synthetase. Covering is a physical guarding and keeping techniques, which develops their ocular quality and lower the incidence of cracking and alters the microenvironment for fruit improvements (Fan and Mattheis, 1998). Before harvesting, coverings are famous agricultural practices mostly used for the producing and qualities of fruits. Covering is a physical conservation procedure, which is not only for the development ocular quality of fruit by enhancing peel colouration and lowering blemishes, but also alter the microenvironment for fruit improvement, and also have various useful effect on inner attributes of fruit. Before harvesting, covering also decrease the occurrence of diseases, insects, pest attack, mechanical damages, sunburn of the peels, fruit crack, agrochemical debris on the fruit, and birds damage. Because of its useful effect, fruit covering is more famous in some fruits like, litchi, guavas, bananas, mangoes, loquat, peaches, pears, grapes, pomegranates, cocoa, date palm and apples growing in various countries (Rajan*et al*., 2020). It is recommended for the farmers to use brown paper bags to attain coloured fruit like yellow colour. However, white paper bags are used to attain the original colour of the variety, both covering materials displayed their potential unto main insets and pests attack. The results are in correspondence with those found by Hegazi *et al*., (2014) and Sarkomi*et al*., (2019) in pomegranate; Panwar and Singh (2018)and Islam *et al*., (2017) in mangoand Rahman *et al*., (2018) in guava.

Table 4.1: Effect of Foliar Spray Of Multi Micronutrient Grade IV And Different Fruit Covering Bags on Fruit Set, Number of Fruits/Tree, Fruit Yield (Kg/Tree), Fruit Weight and Fruit Volume Of Pomegranate Cv. Bhagwa

Treatmen	Fruit set (%)	No.offruits/tree	Fruit yield (kg/tree)	Fruit weight (g)	Fruit volume (ml)
Foliar application of multi micronutrient grade IV					
M_1	36.43	28.63	3.12	150.88	134.20
M_2	49.78	50.70	4.86	180.78	168.60
M_3	26.49	35.14	2.99	158.11	109.35
S.Em	1.29	1.48	0.13	5.42	5.09
C. D. at 5%	3.68	4.20	0.36	15.42	14.48
Different fruit covering bags					
B_1	35.95	36.21	3.08	140.78	113.79
B_2	37.67	38.43	4.05	170.53	143.48
B_3	40.30	40.54	4.64	191.87	168.65
B_4	38.17	40.60	3.88	164.60	139.36
B_5	35.75	35.00	2.64	148.50	121.64
S.Em	1.67	1.91	0.16	7.00	6.57
C. D. at 5%	NS	NS	0.46	19.91	18.70
Interaction (M × B)					
S.Em.±	2.89	3.30	0.28	12.12	11.38
C.D. at 5 %	NS	NS	NS	NS	NS
C.V %	13.34	15.00	13.36	12.86	14.35

Table 4.2: Effect of foliar spray of multi micronutrient grade IV and different fruit covering bags on fruit length, fruit breadth, total sugar, acidity and ascorbic acid of pomegranate cv. Bhagwa

Treatmen	Fruit length (mm)	Fruit breadth (mm)	Total sugar (%)	Acidity (%)	Ascorbic acid (mg/100g)
Foliar application of multi micronutrient grade IV					
M_1	73.65	66.56	12.02	0.39	14.69
M_2	74.36	63.49	12.82	0.34	17.40
M_3	67.16	59.99	11.70	0.38	16.86
S.Em	1.14	2.02	0.13	0.01	0.49
C. D. at 5%	3.24	5.74	0.37	0.03	1.40
Different fruit covering bags					
B_1	68.76	62.47	12.29	0.36	15.85
B_2	71.39	64.07	12.15	0.39	17.23
B_3	74.27	65.84	12.57	0.37	17.23
B_4	70.69	62.48	11.83	0.36	14.96
B_5	73.51	61.87	12.06	0.37	16.32
S.Em	1.47	2.61	0.17	0.02	0.64
C. D. at 5%	4.18	NS	0.48	NS	NS
Interaction (M × B)					
S.Em.±	2.55	4.51	0.29	0.03	1.10
C.D. at 5 %	NS	NS	NS	NS	NS
C.V %	6.15	12.34	4.14	12.45	11.71

Table 4.3: Effect of foliar spray of multi micronutrient grade IV and different fruit covering bags on peel colour, aril colour, shelf life, fruit cracking and fruit borer of pomegranate cv. Bhagwa

Treatmen	Peel colour (score)	Aril colour (score)	Shelf life (DAH)	Fruit cracking (%)	Fruit borer (%)
Foliar application of multi micronutrient grade IV					
M_1	6.12	6.50	24.87	2.73	8.43
M_2	7.11	7.01	26.20	2.40	7.46
M_3	6.75	6.93	24.73	3.00	8.18
S.Em	0.12	0.12	0.43	0.11	0.27
C. D. at 5%	0.35	0.33	1.22	0.30	0.76
Different fruit covering bags					
B_1	6.21	6.47	23.33	4.78	23.40
B_2	6.48	6.64	25.11	2.00	4.91
B_3	7.06	6.92	27.22	1.00	2.65
B_4	6.78	6.82	26.78	2.11	2.99
B_5	6.77	7.23	23.89	3.67	6.16
S.Em	0.16	0.15	0.55	0.14	0.34
C. D. at 5%	0.45	0.43	1.57	0.39	0.98
Interaction (M × B)					
S.Em.±	0.27	0.26	0.96	0.26	0.60
C.D. at 5 %	NS	NS	NS	NS	NS
C.V %	7.06	6.68	6.55	6.68	12.85

CONCLUSIONS

The conclusion or result which received from this experiment showed that foliar spray of micronutrient grade IV @ 1% during flowering and second at three weeks after first spray and brown paper bag showed the better performance for getting higher yield and quality of pomegranate.

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